

What is claimed is:

1 1. A TM microstrip antenna mounted on a projectile
2 comprising:

3 (a) a first rectangular shaped dielectric layer;

4 (b) a plurality of rectangular shaped antenna elements
5 mounted on an upper surface of said first dielectric layer,
6 said antenna elements being aligned with one another and
7 fabricated from copper, said antenna elements being adapted to
8 transmit telemetry data at a frequency of approximately 2.25
9 GHz;

10 (c) an antenna feed network mounted on a bottom surface of
11 said first dielectric layer, said antenna feed network having a
12 main transmission line connected to a signal input for said TM
13 microstrip antenna, said feed network having a plurality of
14 branch transmission lines connected to said main transmission
15 line and each of said antenna elements, each of said branch
16 transmission lines including a plurality of probes, one of said
17 probes being positioned underneath one antenna element of said
18 plurality of antenna elements to capacitively couple said one
19 antenna element to said feed network, resulting in a linear
20 polarization and an omni-directional radiation pattern being
21 generated by said antenna elements of said TM microstrip

22 antenna; and

23 (d) a pair of identical filters integrally formed within
24 said main transmission line, each of said pair of identical
25 filters being tuned at a GPS frequency of approximately 1.575
26 GHz to provide for a minimum isolation of 50 dB.

1 2. The TM microstrip antenna of claim 1 further
2 comprising a continuous gap formed around first, second, third
3 and fourth sides of each of said antenna elements, said
4 continuous gap for each of said antenna elements having an
5 electric field generated by said antenna element confined to
6 said continuous gap.

1 3. The TM microstrip antenna of claim 2 further
2 comprising a copper plated ground mounted on a remaining
3 portion of the upper surface of said first dielectric layer
4 around the continuous gap for each of said antenna elements.

1 4. The TM microstrip antenna of claim 3 further
2 comprising a second dielectric layer positioned below said
3 first dielectric layer in alignment with said first dielectric
4 layer, said second dielectric having a ground plane mounted on

5 a bottom surface thereof.

1 5. The TM microstrip antenna of claim 4 wherein said
2 copper plated ground mounted on the upper surface of said first
3 dielectric layer is connected to the ground plane mounted on
4 the bottom surface of said second dielectric layer by a
5 plurality of vias which pass from said copper plated ground
6 through said first dielectric layer and said second dielectric
7 layer to said ground plane.

1 6. The TM microstrip antenna of claim 1 wherein said pair
2 of identical filters each comprise a 5-Section Band Stop
3 Filter.

1 7. The TM microstrip antenna of claim 1 wherein each of
2 said antenna elements includes a tuning stubs located on one
3 side of said antenna element, said tuning stub for each of said
4 antenna element allowing said antenna element to be fine tuned
5 to an operating frequency for said TM microstrip antenna.

1 8. The TM microstrip antenna of claim 1 wherein said
2 signal input for said feed network comprises a fifty ohm signal

3 input for said feed network.

1 9. The TM microstrip antenna of claim 4 wherein said
2 dielectric layer comprises a circuit board and said second
3 dielectric layer comprises a ground board, said circuit board
4 and said ground board each having an overall dimension of 5.7
5 inches in width and approximately 27 inches in length.

1 10. A TM microstrip antenna mounted on a projectile
2 comprising:

3 (a) a first rectangular shaped dielectric layer;

4 (b) a plurality of rectangular shaped antenna elements
5 mounted on an upper surface of said first dielectric layer,
6 said plurality of antenna elements being aligned with one
7 another and fabricated from copper, said plurality of antenna
8 elements being adapted to transmit telemetry data at a
9 frequency of approximately 2.25 GHz;

10 (c) each of said plurality of antenna elements including a
11 tuning stub located on one side of said antenna element, said
12 tuning stub for each of said plurality of antenna elements
13 allowing said plurality of antenna elements to be fine tuned to
14 an operating frequency for said TM microstrip antenna;

(d) an antenna feed network mounted on a bottom surface of said first dielectric layer, said antenna feed network having a main transmission line connected to a signal input for said TM microstrip antenna, said feed network having a plurality of branch transmission lines connected to said main transmission line and each of said antenna elements, each of said branch transmission lines including a plurality of probes, one of said probes being positioned underneath one antenna element of said plurality of antenna elements to capacitively couple said one antenna element to said feed network, resulting in a linear polarization and an omni-directional radiation pattern being generated by said antenna elements of said TM microstrip antenna;

(e) a pair of identical filters integrally formed within said main transmission line, each of said pair of identical filters being tuned at a GPS frequency of approximately 1.575 GHz to provide for a minimum isolation of 50 dB, each of said pair of filters comprising a band stop filter; and

(h) a second dielectric layer positioned below said first dielectric layer in alignment with said first dielectric layer, said second dielectric layer having a ground plane mounted on a bottom surface thereof.

1 11. The TM microstrip antenna of claim 10 further
2 comprising a continuous gap formed around first, second, third
3 and fourth sides of each of said plurality of antenna elements,
4 said continuous gap for each of said plurality of antenna
5 elements having an electric field generated by said antenna
6 element confined to said continuous gap.

1 12. The TM microstrip antenna of claim 11 further
2 comprising a copper plated ground mounted on a remaining
3 portion of the upper surface of said first dielectric layer
4 around the continuous gap for each of said plurality of antenna
5 elements.

1 13. The TM microstrip antenna of claim 12 wherein said
2 copper plated ground mounted on the upper surface of said first
3 dielectric layer is connected to the ground plane mounted on
4 the bottom surface of said second dielectric layer by a
5 plurality of vias which pass from said copper plated ground
6 through said first dielectric layer and said second dielectric
7 layer to said ground plane.

1 14. The TM microstrip antenna of claim 10 wherein said
2 band stop filter for each of said pair of identical filters
3 comprises a 5-Section Band Stop Filter.

1 15. The TM microstrip antenna of claim 10 wherein said
2 signal input for said feed network comprises a fifty ohm signal
3 input for said feed network.

1 16. The TM microstrip antenna of claim 10 wherein said
2 dielectric layer comprises a circuit board and said second
3 dielectric layer comprises a ground board, said circuit board
4 and said ground board each having an overall dimension of 5.7
5 inches in width and approximately 27 inches in length.

1 17. A TM microstrip antenna mounted on a projectile
2 comprising:

- 3 (a) a first rectangular shaped dielectric layer;
4 (b) eight rectangular shaped antenna elements mounted on
5 an upper surface of said first dielectric layer, said eight
6 antenna elements being aligned with one another and fabricated
7 from copper, said eight antenna elements being adapted to
8 transmit telemetry data at a frequency of approximately 2.25

9 GHz;

10 (c) each of said eight antenna elements including a tuning
11 stub located on one side of said antenna element, said tuning
12 stub for each of said eight antenna elements allowing said
13 eight antenna elements to be fine tuned to an operating
14 frequency for said TM microstrip antenna;

15 (d) an antenna feed network mounted on a bottom surface of
16 said first dielectric layer, said antenna feed network having a
17 main transmission line connected to a signal input for said TM
18 microstrip antenna, said feed network having a plurality of
19 branch transmission lines connected to said main transmission
20 line and each of said eight antenna elements, each of said
21 branch transmission lines including a plurality of probes, one
22 of said probes being positioned underneath one antenna element
23 of said eight antenna elements to capacitively couple said one
24 antenna element to said feed network, resulting in a linear
25 polarization and an omni-directional radiation pattern being
26 generated by said antenna elements of said TM microstrip
27 antenna;

28 (e) a pair of identical band stop filters integrally
29 formed within said main transmission line, each of said pair of
30 band stop filters being tuned at a GPS frequency of

31 approximately 1.575 GHz to provide for a minimum isolation of
32 50 dB; and

33 (h) a second dielectric layer positioned below said first
34 dielectric layer in alignment with said first dielectric layer,
35 said second dielectric layer having a ground plane mounted on a
36 bottom surface thereof.

1 18. The TM microstrip antenna of claim 17 further
2 comprising a continuous gap formed around first, second, third
3 and fourth sides of each of said eight antenna elements, said
4 continuous gap for each of said eight antenna elements having
5 an electric field generated by said antenna element confined to
6 said continuous gap.

1 19. The TM microstrip antenna of claim 18 further
2 comprising a copper plated ground mounted on a remaining
3 portion of the upper surface of said first dielectric layer
4 around the continuous gap for each of said plurality of antenna
5 elements.

1 20. The TM microstrip antenna of claim 20 wherein said
2 copper plated ground mounted on the upper surface of said first

3 dielectric layer is connected to the ground plane mounted on
4 the bottom surface of said second dielectric layer by a
5 plurality of vias which pass from said copper plated ground
6 through said first dielectric layer and said second dielectric
7 layer to said ground plane.